Diamond photonic platforms for quantum optics and quantum sensing| 5GS	**Start Date:** February 1st 2016
PhD: Stefan Häußler (Ulm)	**PIs:** Prof. Alexander Kubanek (Ulm) Jun.-Prof. Stefan Strehle (Ulm)

Abstract: In collaboration with engineering faculties this interdisciplinary research project is aimed to investigate novel nano- and micro-fabrication techniques for diamond. The goal is to develop new optical interfaces, in particular for color centers in diamond. Structures under investigation are resonant photonic structures such as micro-resonators as well as non-resonant structures. Tailoring and functionalising diamond as a host material for quantum emitters enables to take advantage of unique properties of diamond. In particular, a large transparency window from UV to infrared, high mechanical hardness, large refractive index and high thermal conductivity are most relevant. In addition, many luminescent color center exist in the diamond matrix, such as Nitrogen-Vacancy center, Silicon- Vacancy center or NE8. Applications include photonic diamond devices with integrated color center. The all-diamond integrated design allows us, for example, to optimize coupling strength between quantum emitter and light field due to precise localization of color center in the field maxima of electromagnetic modes. An outstanding challenge is to achieve the strong-coupling regime, where the irreversible process of photon emission becomes reversible and an energy transfer rate between atomic excitation and excitation in the light field dominates any loss channels in the system.

Recent results:	**Publications:**
• *RT set-up is now operational* • *Coupling an ensemble of SiV- centers in diamond to the mode of an fiber-based optical resonator with free-space dispersion relation has been achieved at RT*	• In preparation: Coupling an ensemble of SiV- centers in diamond to the mode of an fiber-based optical resonator with free-space dispersion relation. • Photoluminescence excitation spectroscopy of SiV− and GeV− color center in diamond, Stefan Häußler, Gergő Thiering, A. Dietrich, N. Waasem, T. Teraji, Junichi Isoya, Takayuki Iwasaki, Mutsuko Hatano, Fedor Jelezko, Adam Gali and Alexander Kubanek, New Journal of Physics, 19 (2017) 063036

Further Collaborators: Adam Gali, Junichi Isoya, Mutsuko Hatano